

DEVICE FOR CHANGING THE ANGLE OF ROTATION  
OF A CAMSHAFT RELATIVE TO A DRIVE WHEEL  
OF AN INTERNAL COMBUSTION ENGINE

BACKGROUND OF THE INVENTION

The invention relates to a device for changing the angle of rotation of a camshaft relative to a drive wheel of an internal combustion engine including a hydraulic adjusting arrangement.

5 DE 195 02 496 A1 discloses a device for changing the timing of an internal combustion engine. The internal combustion engine has a cylinder head in which a camshaft is mounted, the camshaft being provided at its one end with the device for changing the timing. The device has a hydraulic adjusting arrangement which is subjected to fluid  
10 medium in a specific manner via an on/off valve. The camshaft is enclosed in its end region, which faces the device, by a connecting bracket which is connected integrally to a valve housing for accommodating the on/off valve. The  
15 connecting bracket is preferably positioned within the cylinder head, specifically directly behind the end wall of the cylinder head, which faces the device. This means that the connecting bracket can be arranged only at the front or at the rear end of the camshaft. Oil is supplied to the  
20 on/off valve via a separate ring.

Reference is also made to DE 197 26 365 A1 in respect of the general technical background.

It is the object of the invention to provide a device which can be arranged in a variable manner with little structural space being required.

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#### SUMMARY OF THE INVENTION

In a device for hydraulically changing the angle of rotation of a camshaft relative to a drive wheel of an internal combustion engine including a hydraulic adjusting arrangement which is arranged between the drive wheel and the camshaft and is connected to a fluid circuit of the internal combustion engine, such that the fluid is admitted to the adjusting arrangement via an on/off valve, and the camshaft is mounted in camshaft bearings, the on/off valve for controlling the fluid supply to the adjusting arrangement is at least partially integrated in one of the camshaft bearings.

One substantial advantage of the invention is that the arrangement of the device and, in particular, of the on/off valve is not restricted to the ends of the camshaft or the end walls of the cylinder head but that each camshaft bearing is a suitable location. A separate component for accommodating the on/off valve can therefore be omitted.

Because of the fact that the hydraulic adjusting arrangement is supplied with fluid via fluid bores in the camshaft bearing, additional fluid supply lines are not required. The fluid bores can be cost-effectively cast in advance into the camshaft bearing and are distinguished therefore by being short in length.

With the arrangement according to the invention in the camshaft bearing, the on/off valve is advantageously not situated in the oil chamber and neither are the associated electrical lines which means that the electrical lines do not have to be sealed.

Further refinements and advantages of the invention will become apparent from the following description on the basis of the accompanying drawings.

5                    BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an exemplary embodiment of the invention, and

Fig. 2 is a side view of the arrangement as shown in  
10 Fig. 1.

DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 shows an internal combustion engine having a cylinder head 1 (part of which is illustrated), camshaft  
15 bearings 2 for the mounting of at least one camshaft 3, only one bearing 2 of which can be seen here, and a cylinder-head cover 4 which covers the cylinder head 1 and the at least one camshaft 3. The camshaft bearings 2 each have a bearing shell 2a and a bearing cover 2b, the bearing  
20 shell 2a advantageously being integrally formed on the cylinder head 1 and the bearing cover 2b either being formed as a separate part or, as shown here, being formed integrally with the cylinder-head cover 4.

To change the angle of rotation of the camshaft 3  
25 relative to a drive wheel 10 of the internal combustion engine, a hydraulic adjusting arrangement 11 is arranged between the drive wheel 10 and the camshaft 3 and is connected to a fluid or oil circuit of the internal combustion engine, the fluid being admitted in a specific manner via  
30 an on/off valve 5.

In order to make a compact structural form and a variable arrangement of the device possible, the on/off valve 5 is integrated according to the invention at least partially in one of the camshaft bearings 2, specifically and advantageously in the bearing cover 2b mounted on the bearing  
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shell 2a of the camshaft bearing 2. In order to at least partially accommodate the on/off valve 5, the bearing cover 2b has a receiving bore 6 into which the on/off valve 5 can be inserted.

5        To supply the hydraulic adjusting arrangement with fluid, fluid bores 7 to 9 are arranged in the camshaft bearing 2 and can advantageously be provided upon casting of the bearing structure. The fluid bores 7 to 9 include at least one fluid inlet 7 for supplying the on/off valve 5  
10 with fluid, at least one fluid outlet 8 for transferring the fluid to the hydraulic adjusting arrangement 11 and at least one fluid return flow passage 9 for returning the excess fluid from the on/off valve 5 into the fluid circuit of the internal combustion engine. The fluid can be supplied to the fluid inlet 7 in the camshaft bearing 2 from  
15 the cylinder head 1 and from the cylinder-head cover 4.